

### **REMARKS**

The Official Action dated November 5, 2003 has been carefully considered. Accordingly, it is believed that the following remarks demonstrate the patentability of the pending claims and place the present application in condition for allowance. Reconsideration is respectfully requested.

Initially, the Examiner noted in the Official Action that claims 63-118 have been requested to be subjected to an Interference Under 37 C.F.R. §1.607. No rejection of these claims was set forth in the Official Action. Accordingly, it is believed that claims 63-118 are in condition for allowance.

Claims 1, 5, 6, 8, 9, 13-15, 23, 27, 28, 30, 43-45, 48, 51, 54, 55 and 62 were rejected under 35 U.S.C. §103(a) as being unpatentable over the Willemse U.S. Patent No. 4,973,682 (Willemse '682) or the Volpenhein U.S. Patent No. 4,517,360, in view of the Willemse European Reference EP 349 059 (Willemse '059), the Balint et al U.S. Patent No. 3,689,461 (Balint et al '461), the Balint et al U.S. Patent No. 3,679,368 (Balint et al '368), the Seltzer U.S. Patent No. 3,567,369 or the Mansour U.S. Patent No. 4,449,828. The Examiner asserted that Willemse '682 discloses a process for the synthesis of polyol fatty acid polyesters comprising a two-stage transesterification of polyol to polyester wherein the polyol is esterified to a degree of conversion within the range of 10-50% substantially without leaving non-participating polyol, and in a subsequent final stage, the reaction is caused to proceed to a degree of conversion of at least 70%. The Examiner noted the disclosed molar ratio of fatty acid lower-alkyl ester:sucrose, the molar ratio of catalyst:polyol, alkali metal soaps, transesterification reaction temperatures, reaction vessels and removal of lower-alkyl alcohol disclosed by Willemse. The Examiner also asserted that Willemse suggests that the process can be carried out in a continuous or semi-continuous operation. Further, the Examiner

asserted that Volpenhein discloses a transesterification process for synthesizing polyol fatty acid polyesters and that the process disclosed by Volpenhein is within the scope of the process set forth in the instant claims.

The Examiner relied on Willemse EP '059 as disclosing a process for the synthesis of polyol fatty acid polyesters in which at least during the final stage of the transesterification reaction, the reaction mixture is submitted to the action of a stripping agent suitable for accelerating the removal of a lower alkyl alcohol formed in the reaction. The Examiner asserted that the Balint et al '461 reference discloses a process for the preparation of linear condensation polyesters in a continuous or discontinuous process and that Fig. 1 suggests plug flow conditions. The Examiner asserted that the Balint et al '368 reference, Seltzer and Mansour all show that the preparation of products in a continuous operation under conditions of backmixing and plug flow is well known in the art. The Examiner concluded it would have been obvious to modify Willemse '682 and Volpenhein's processes by applying the various conditions under which the process is to be carried out as suggested by Willemse EP '059 and Balint et al '461, Balint et al '368, Seltzer and Mansour.

However, Applicants submit that the processes defined by independent claims 1 and 62, and claims 5, 6, 8, 9, 13-15, 23, 27, 28, 30, 43-45, 48, 51, 54 and 55 dependent thereon, are nonobvious over and patentably distinguishable from the combination of references cited by the Examiner. Accordingly, this rejection is traversed and reconsideration is respectfully requested.

More particularly, as defined by claim 1, the invention is directed to a continuous process for preparing highly esterified polyol fatty-acid polyester by interesterifying polyol containing more than about four esterifiable hydroxy groups and fatty-acid ester of easily removable alcohol in a heterogeneous reaction mixture. A combination of reaction

conditions is specified. Namely, the catalyst is used in the reaction mixture at an initial level of from about 0.01 to about 0.5 mol of catalyst per mol of polyol, a soap emulsifier is used in the initial stage of the process at a level of from about 0.001 to about 0.6 mol of soap per mol of polyol, the molar ratio of total ester reactant to each esterifiable hydroxy group of the polyol in the reaction mixture range is from about 0.9:1 to about 1.2:1, the temperature in the initial stage of the process ranges from about 130°C to about 140°C, and in the final stages of the process ranges from about 80°C to about 120°C, and easily removable alcohol is removed from the reaction mixture as the interesterifying reaction proceeds. Additionally, the initial stage of the interesterifying reaction is carried out in a continuous manner under conditions of backmixing suitable for maintaining within the reaction mixture a level of lower partial fatty acid esters of polyol that is sufficient to emulsify the reaction mixture.

Claim 62 is in Jepson format and recites a continuous process for preparing highly esterified polyol fatty acid polyester by interesterifying polyol containing more than four esterifiable hydroxy groups and fatty acid ester of an easily removable alcohol in a heterogeneous reaction mixture wherein the easily removable alcohol is removed from the reaction mixture as the reaction proceeds. The improvement comprises carrying out an initial stage of the interesterifying reaction in a continuous manner under conditions of backmixing suitable for maintaining within the reaction mixture a level of lower partial fatty acid esters of the polyol that is sufficient to emulsify the reaction mixture, and carrying out at least a final stage of the interesterifying reaction in a continuous manner under conditions approaching plug-flow conditions after the degree of esterification of the polyol has reached at least about 50%.

As set forth in the present specification, for example at page 1, lines 13-19, and as demonstrated in the examples in the present application, the presently claimed process

provide a continuous process that is capable of making the desired polyol fatty acid polyesters of improved quality and in an efficient manner. As set forth in the specification, for example beginning at page 19, line 3, it is desirable to conduct the initial stage or stages of the reaction under backmixing conditions to maintain the degree of esterification in a desired range, which, in turn, provides sufficient lower partial polyol polyester to aid in the solubilization of a poorly soluble polyol and a stable heterogeneous reaction mixture that minimizes unreacted polyol, while preventing overfoaming. As set forth at page 19, lines 15-19, the combination of backmixing conditions with a continuous reaction allows individual reactants to be added to the first stage at a rate that maintains the desired degree of esterification and yet provides sufficient yield from the first stage to maintain the reaction in subsequent stages. Further, conducting the final stages under conditions of plug flow as required by claim 62 allows more efficient processing under stringent and costly conditions, for example, lower pressures and higher sparge rates, while achieving high degrees of esterification in the final product.

As noted by the Examiner, both Willemse '682 and Volpenhein disclose methods for synthesis of polyol fatty acid polyesters by transesterification of polyol with fatty acid ester reactant. Willemse '682 is particularly directed to controlling the partial vapor pressure of lower-alkyl alcohol formed during the transesterification reaction such that the reaction cannot proceed beyond a degree of conversion which corresponds to esterification to the polyol monoester and/or oligoesters (column 2, lines 11-18). While Willemse '682 indicates at column 5, lines 66-68 that in a continuous or semi-continuous operation the drying chamber and reaction vessel preferably are separate, Applicants find no other teaching or suggestion in Willemse '682 relating to a continuous process. Particularly, Applicants find no teaching or suggestion in Willemse '682 relating to a continuous process carried out under

conditions of backmixing, and, specifically, under conditions of backmixing suitable for maintaining within a reaction mixture a level of lower partial fatty acid esters of polyol that is sufficient to emulsify the reaction mixture as recited in claims 1 and 62. Moreover, Applicants find no teaching or suggestion in Willemse '682 that in such a continuous process, at least a final stage of the interesterifying reaction should be conducted under conditions approaching plug-flow conditions, particularly after the degree of esterification of the polyol has reached at least about 50%, as required by claim 62. To the contrary, the specific exemplary teachings of Willemse '682 are directed to batch processes.

Volpenhein is specifically directed to an improved transesterification process wherein a basic catalyst component selected from the group consisting of potassium carbonate, sodium carbonate, barium carbonate and mixtures thereof is employed. However, Applicants find no teaching or suggestion by Volpenhein relating to a continuous process, particularly wherein an initial stage of the reaction is carried out in a continuous manner under conditions of backmixing or, more specifically, under conditions of backmixing suitable for maintaining within the reaction mixture a level of lower partial fatty acid esters of the polyol that is sufficient to emulsify the reaction mixture as required by claims 1 and 62. Similarly, Applicants find no teaching or suggestion by Volpenhein of such a process wherein at least a final stage of the interesterifying reaction is carried out in a continuous manner under conditions approaching plug-flow conditions after the degree of esterification of the polyol has reached at least about 50%, as further required by claim 62. To the contrary, the specific exemplary teachings of Volpenhein are directed to batch processes.

Further, Applicants find no teaching or suggestion by Willemse '682 or Volpenhein of the combination of reaction conditions recited in claim 1. For example, while the combination of reaction conditions specified in claim 1 require that the temperature in the

initial stage of the process ranges from about 130°C to about 140°C and in the final stages of the process ranges from about 80°C to about 120°C, Willemse '682 discloses slightly raising the temperature during the later stage of the transesterification reaction (column 3, lines 52-54). Similarly, Volpenhein discloses that after the excess ester is added to the reaction mixture in stage two, the mixture is heated to a temperature of from about 120°C to about 160°C, preferably about 135°C (column 5, lines 53-57). As set forth in the present specification, for example at page 18, beginning at line 6, the lower temperature in the later stage of the reaction has surprisingly been found to minimize undesirable side reactions. The speed of the reaction, surprisingly, can be maintained by control of other reaction parameters, for example improved removal of the lower alcohol. Applicants find no teaching or suggestion by either Willemse '682 or Volpenhein in this regard.

Moreover, the deficiencies of Willemse '682 and Volpenhein are not resolved by Willemse EP '059, Balint et al, Seltzer or Mansour. First, Applicants note that Willemse EP '059 is not proper prior art with respect to the present application. That is, the present application has an effective U.S. filing date of September 11, 1990. However, as set forth in the showing under 37 C.F.R. §1.608(b) in support of the Request for Interference Under 37 C.F.R. §1.607 filed April 19, 1999, the present invention was reduced practice at least as early as January 20, 1989 and was not abandoned, suppressed or concealed between the reduction to practice in January 1989 and the filing of the original parent application on September 11, 1990. In contrast, the effective date of Willemse EP '059 is its publication date of January 3, 1990, subsequent to the reduction to practice of the present invention. Thus, EP '059 is not proper prior art with respect to the present application.

Moreover, Willemse EP '059 does not provide any teaching or suggestion for resolving the above-noted deficiencies of Willemse '682 and Volpenhein. While Willemse

EP '059, like Willemse '682, briefly indicates that in a continuous or semi-continuous operation, the drying chamber and reaction vessel preferably are separate (page 4, lines 46-47), Applicants find no teaching or suggestion in this reference relating to continuous processes as recited in claims 1 and 62 wherein the initial stage of the interesterifying reaction is carried out in a continuous manner under conditions of backmixing suitable for maintaining within the reaction mixture a level of partial fatty acid esters of the polyol that is sufficient to emulsify the reaction mixture, or as further recited in claim 62, that a final stage of the interesterifying reaction may be carried out in a continuous manner under conditions approaching plug-flow conditions after the degree of esterification of the polyol has reached about 50%.

The Examiner has cited the Balint et al, Seltzer and Mansour references based on their disclosures of continuous processes with backmixing and/or plug flow. In fact, Applicants themselves cite Seltzer, Balint et al '368 and Mansour at pages 20-21 of the present specification as disclosing backmixing and/or plug-flow conditions. However, in the absence of this teaching in the present specification, one of ordinary skill in the art would have no motivation for combining any of the teachings of Balint et al, Seltzer or Mansour with the teachings of either Willemse '682 or Volpenhein. In this regard, Applicants note that Balint et al '461 and '368 are directed to processes for the preparation of linear condensation polyester polymers of high molecular weight and high quality for fiber, filament and film production (see, for example, Balint et al '461, column 2, lines 52-57). More specifically, Balint et al react ethylene glycol and terephthalic acid to form the linear high molecular weight polyester polymers. Applicants find no teaching or suggestion by Balint et al relating to a process for preparing highly esterified polyol fatty-acid polyester, particularly of sugar alcohols as taught by Willemse '682 and Volpenhein. Seltzer is directed to an apparatus for

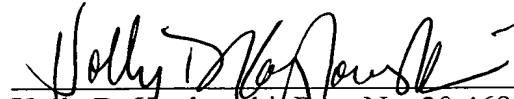
preparing epoxidized organic compounds by reaction of a peracid epoxidizing agent and an unsaturated organic compound. However, Applicants find no teaching or suggestion by Seltzer relating to processes for the synthesis of highly esterified polyol fatty acid polyesters, particularly using a sugar polyol, as taught in Willemse '682 and Volpenhein. Finally, Mansour discloses a mixing apparatus, for example for making polyester resins (column 3, line 1). However, Applicants find no teaching or suggestion relating to processes for preparing highly esterified polyol fatty acid polyesters as taught by either Willemse '682 or Volpenhein. Thus, there simply is no motivation in any of the cited references for combining their teachings along the lines asserted by the Examiner.

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching, suggestion or incentive supporting the combination, *In re Geiger*, 2 U.S.P.Q.2d 1276, 1278 (Fed. Cir. 1987). Applicants find no such teaching, suggestion or incentive supporting the combination asserted by the Examiner. Thus, the cited combination of references does not render the presently claimed processes obvious under 35 U.S.C. §103. It is therefore submitted that the rejection of claims 1, 5, 6, 8, 9, 13-15, 23, 27, 28, 30, 43-45, 48, 51, 54, 55 and 62 under 35 U.S.C. §103 has been overcome. Reconsideration is respectfully requested.



It is believed that the above represents a complete response to the Official Action, and places the present application in condition for allowance. Reconsideration and an early allowance are requested.

Respectfully submitted,



Holly D. Kozlowski, Reg. No. 30,468  
DINSMORE & SHOHL LLP  
1900 Chemed Center  
255 E. Fifth Street  
Cincinnati, Ohio 45202  
(513) 977-8568

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